

✓ 1 ✓ 3 ✓ 4
heat exchanger leaks, and subsequently – if any such leakage is detected – the location of the leakages is determined. It follows that, in accordance with a third aspect, the invention relates to a method comprising in situ leakage control and localization of leakages in the internal faces that separate the product and service sides of heat exchangers.

Replace the paragraph beginning at page 5, lines 1-8, with:

✓ 1 ✓ 3 ✓ 4
This technology, which is known from U.S. patent No. 4,745,797 relating to a method wherein a mineral oil based colour solution is applied to the surface of the object on which it is desired to perform the test. The colour solution that penetrates through leakages in the surfaces causes a subsequent colour reaction on the opposite side of the surface, thereby revealing the leakage.

Replace the paragraph beginning at page 5, lines 10-13, with:

✓ 1 ✓ 3 ✓ 4
An indirect colour method for localising cracks in a surface is described in DE patent No. 1,773,270, where the penetrating substance is not readily visible, but it is rendered visible by exposure to UV-light.

Replace the paragraph beginning at page 7, lines 18-34, with:

✓ 1 ✓ 4
In accordance with the invention, a first step is concerned with leakage control, wherein one of the primary and secondary sides of a plate heat exchanger is supplied with a colorant liquid while the opposite side is supplied with a clear liquid that is recycled. The presence of leakages in the heat exchanger is verified by detection of the presence of colorant in the clear liquid. Hereby a reliable indication is obtained whether the heat exchanger leaks, and since it does not present any problems to find an environmentally friendly and very powerful colorant that can be measured in very small concentrations in the clear liquid, the method is both reliable and inexpensive. Moreover, it is quite simple to imitate the operating conditions during the leakage control, thereby ensuring that the control does in fact indicate the leakages that will occur in actual operation, neither more nor less.

Replace the paragraph beginning at page 8, lines 1-17, with:

✓ 1 ✓ 7
In accordance with the second aspect of the invention, certain advantages are achieved when a colorant-containing liquid is supplied to one side of the heat exchanger, and when this side is pressurised for a period of time. The other side is maintained at ambient in that it contains air. After the period of time, the heat exchanger is drained and the plates are separated. Leaks are then determined by visual inspection of the plates. It is possible to find a colorant for this purpose that will, on the one hand, be readily dissolved and, on the other hand,

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subsequently produce very clear indications on the opposite side of the locations of the leakages. At the same time it is very simple, by this method, to imitate the heat exchanger operating conditions. This means that the detected leakages are the same or about the same as will appear in actual operation.

Replace the paragraph beginning at page 8, lines 25-31, with:

A 1
In accordance with an optional feature of the invention, the leakage control and the localisation of leakages may be accomplished in conditions that are very close to or identical with the actual operating conditions of the heat exchanger. This involves substantial advantages since the leakages detected in this manner will be the exact same as those occurring in ordinary operation of the heat exchanger.

Replace the paragraph beginning at page 8, line 33, through page 9, line 4, with:

A 8
The colorant used can be any one of liquid or dissolvable colorant or mixtures of such substances that will, in an aqueous and highly diluted in-use solution, directly – or by means of UV-light – trigger a visualisation.

Replace the paragraph beginning at page 9, lines 6-20, with:

A 9
According to another embodiment, an aqueous solution of the fluorescent colorant uranine (the sodium salt of fluoresceine) is used. This solution has a very intense colouring and powerful fluorescence that makes it easy to visualise with UV-light in very small amounts (a dilution of uranine in a ratio of 1 to 200 mill in pure water can readily be detected by the human eye). Advantageously, this colorant is approved for use as trace substance for, among other things, life saving at sea, tracing of subterranean water current and checking of weak blood circulation in humans. Thus there will not be any problems associated with obtaining permissions to use this substance in the foodstuffs industry, and it does not present an environmental hazard.

Replace the paragraph beginning at page 9, line 22, through page 10, line 6, with:

A 10
As explained above, considerable advantages are achieved with use of the methods for leakage control and localisation of leakages in accordance with the invention. These advantages may be obtained by performing a leakage control in a first step by supplying a colorant-containing solution to one of the product and service sides of the heat exchanger. A of the heat exchanger. A clear liquid that is preferably recycled is applied to the opposite side. The presence of leakages in the heat exchanger is verified by detection of the colorant in the clear liquid. Also, the presence of leakages may be revealed by pressurisation of the side containing